

August 27, 2007

Mr. Christopher M. Crane  
President and CNO  
Exelon Nuclear  
Exelon Generation Company, LLC  
200 Exelon Way  
Kennett Square, PA 19348

SUBJECT: LIMERICK GENERATING STATION - NRC TRIENNIAL FIRE PROTECTION  
INSPECTION REPORT 05000352/2007006 AND 05000353/2007006

Dear Mr. Crane:

On August 3, 2007, the NRC completed a triennial fire protection team inspection at your Limerick Generating Station. The enclosed report documents the inspection results which were discussed at an exit meeting on August 9, 2007, with Mr. C. Mudrick and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one NRC-identified finding of very low safety significance (Green). The finding was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because it was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Limerick Generating Station.

C. Crane

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Sincerely,

**/RA/**

John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

Docket Nos. 50-352, 50-353  
License Nos. NPF-39, NPF-85

Enclosure: NRC Inspection Report 05000352/2007006 and 05000353/2007006

C. Crane

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cc w/encl:

Chief Operating Officer, Exelon Generation Company, LLC

Site Vice President - Limerick Generating Station

Plant Manager, Limerick Generating Station

Regulatory Assurance Manager - Limerick

Senior Vice President - Mid-Atlantic Operations

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Director - Licensing and Regulatory Affairs, Exelon Generation Company, LLC

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J. Johnsrud, National Energy Committee, Sierra Club

Chairman, Board of Supervisors of Limerick Township

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C. Crane

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No. 50-352, 50-353

License No. NPF-39, NPF-85

Report No. 05000352/2007006 and 05000353/2007006

Licensee: Exelon Generation Company, LLC

Facility: Limerick Generating Station, Units 1 & 2

Location: Sanatoga, PA 19464

Dates: July 16, 2007 through August 3, 2007

Inspectors: K. Young, Senior Reactor Inspector, DRS  
P. Finney, Reactor Inspector, DRS  
J. Lilliendahl, Reactor Inspector, DRS  
O. Yee, Nuclear Safety Professional Development Program, DRS

Approved by: John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000352/2007006, 05000353/2007006; 07/16/2007 - 08/03/2007; Exelon Nuclear; Limerick Generating Station, Units 1 and 2; Triennial Fire Protection Team Inspection.

The report covered a two-week triennial fire protection team inspection by three Region I specialist inspectors. One Green finding was identified. The significance of most findings is indicated by their color (Green, White, Yellow) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### A. NRC-Identified Findings

#### **Cornerstone: Mitigating Systems**

- Green. The team identified a finding of very low safety significance (Green) involving a non-cited violation of the Limerick Generating Station operating license, in that the procedure for shutting down the plant in response to a fire in the cable spreading room was not consistent with the safe shutdown analysis. Specifically, impediments related to the safe shutdown procedure would have prevented the operators from securing the high pressure coolant injection (HPCI) system within the design time limit. Fire induced cable failures in the cable spreading room could allow HPCI to overfill the reactor vessel which would adversely affect the operation of the reactor core isolation cooling (RCIC) system and the main steam relief valves (MSRVs).

This issue was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of the RCIC system and MSRVs under postulated fire scenarios. The finding was of very low safety significance based on a Phase 2 Significance Determination Process (SDP) evaluation performed in accordance with IMC 0609, Appendix F, "Fire Protection Significance Determination Process." (Section 1R05.01)

### B. Licensee-Identified Violations

None

## REPORT DETAILS

### Background

This report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, "Fire Protection." The objective of the inspection was to assess whether Exelon Nuclear, has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained at the Limerick Generating Station (LGS). The following fire areas (FAs) were selected for detailed review based on risk insights from the LGS Individual Plant Examination of External Events (IPEEE):

- Fire Area 12
- Fire Area 23
- Fire Area 68
- Fire Area 79

The inspection team evaluated the licensee's fire protection program (FPP) against applicable requirements which included plant technical specifications, operating license condition 2.C.3, NRC safety evaluation reports (SERs), 10 CFR 50.48, and Branch Technical Position (BTP) Chemical Engineering Branch (CMEB) 9.5-1. The team also reviewed related documents that included the Updated Final Safety Analysis Report (UFSAR), the fire hazards analysis (FHA), and the safe shutdown analysis.

Specific documents reviewed by the team are listed in the attachment.

### **1. REACTOR SAFETY**

Cornerstones: Initiating Events, Mitigating Systems

#### 1R05 Fire Protection

##### .01 Post-Fire Safe Shutdown From Outside the Main Control Room (Alternative Shutdown) and Normal Shutdown

###### a. Inspection Scope

###### Methodology

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings (P&IDs), electrical drawings, the UFSAR and other supporting documents to verify that hot and cold shutdown could be achieved and maintained from outside the control room for fires that rely on shutdown from outside the control room. This review included verification that shutdown from outside the control room could be performed both with and without the availability of offsite power. Plant walkdowns were also performed to verify that the plant configuration was consistent with that described in the safe shutdown and fire hazards analyses. These inspection activities focused on ensuring the adequacy of systems selected for reactivity control, reactor coolant

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makeup, reactor decay heat removal, process monitoring instrumentation and support systems functions. The team verified that the systems and components credited for use during post-fire safe shutdown would remain free from fire damage. The team verified that the transfer of control from the control room to the alternative shutdown location(s) would not be affected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for alternative shutdown control circuits).

Similarly, for fire areas that utilize shutdown from the control room, the team also verified that the shutdown methodology properly identified the components and systems necessary to achieve and maintain safe shutdown conditions.

### Operational Implementation

The team verified that the training program for licensed and non-licensed operators included alternative shutdown capability. The team also verified that personnel required for safe shutdown using the normal or alternative shutdown systems and procedures were trained, available onsite at all times, and exclusive of those assigned as fire brigade members.

The team reviewed the adequacy of procedures utilized for post-fire safe shutdown and performed an independent walk through of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team also verified that operators could reasonably be expected to perform specific actions within the time required to maintain plant parameters within specified limits. Time critical actions which were verified included restoring alternating current (AC) electrical power, establishing remote shutdown panel operation, establishing reactor coolant makeup, and establishing decay heat removal.

Specific procedures reviewed for alternative shutdown, including shutdown from outside the control room included the following:

- SE-1, Remote Shutdown, Revision 24;
- 2FSSG-3023, Fire Area 23 Fire Guide, Revision 2; and
- 2FSSG-3068W, Fire Area 68W Fire Guide, Revision 2.

The team reviewed manual actions to ensure that they had been properly reviewed and approved and that the actions could be implemented in accordance with plant procedures in the time necessary to support the safe shutdown method for each fire area. The team also reviewed periodic testing records of the alternative shutdown transfer capability and instrumentation and control functions to ensure the tests demonstrated the functionality of the alternative shutdown capability.

### b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving a violation of the LGS operating license, in that the procedure for shutting

down the plant in response to a fire in the cable spreading room was not consistent with the safe shutdown analysis. Specifically, human performance impediments related to the safe shutdown procedure would have prevented the operators from securing high pressure coolant injection (HPCI) within the design time limit. Fire induced cable failures in the cable spreading room could cause the spurious operation of the HPCI system and result in overfill of the reactor vessel. This would affect the operation of reactor core isolation cooling (RCIC) system and the main steam relief valves (MSRVs).

Description: LGS's thermal hydraulic analysis for fire safe shutdown, G-080-VC-00028, analyzes a scenario where a fire in the cable spreading room causes a spurious start of HPCI that also bypasses the HPCI level 8 automatic trip. For this scenario, there is a protected switch at the remote shutdown panel which will secure HPCI. The analysis determined that for the worst case conditions, HPCI must be secured within four minutes. If not secured promptly, HPCI would overfill the reactor vessel and water would enter the main steam lines which would adversely impact RCIC and the MSRVs. Operator action to secure the HPCI system is credited in the fire safe shutdown analysis for the Unit 2 cable spreading room, LF-0016-023.

During the inspection, several walkdowns conducted in the plant and in the simulator were performed to assess the ability to secure HPCI within the specified four minutes. During these walkdowns several complications were identified, two of which were significant. First, the single key required to secure the HPCI system was located inside a box containing sixty similar keys, but was not labeled for quick identification. Second, the procedure directing the operator to secure HPCI, procedure 2FSSG-3023, "Fire Area 023 Fire Guide," referred to a section in procedure SE-1, "Remote Shutdown," which was ambiguous since the exact step was not referenced and the necessary prerequisites were not identified. Based upon these human performance impediments and a demonstration conducted by the licensee which took nearly seven minutes to complete, the team had no confidence that the HPCI system could be secured within the four minute time limit.

Corrective action program issue report (IR) 656185 was written to address this issue. LGS promptly added clear labeling for the HPCI key, revised all affected fire response procedures, and conducted operator training on securing HPCI following a postulated fire in the cable spreading room. The team concluded that these corrective actions were appropriate and provided reasonable assurance that a reactor vessel overfill event could be averted in the event of a spurious fire induced HPCI system initiation. A preliminary evaluation by LGS concluded that the thermal hydraulic analysis, of record, was overly conservative and that the time available to secure HPCI prior to vessel overfill may be between 6.5 to 7 minutes. The team learned that LGS was considering a revision to the design basis to extend the available time to the operators to secure HPCI.

The performance deficiency associated with this finding was that LGS failed to assure that an important time requirement in the safe shutdown analysis was translated and properly validated in the remote shutdown procedure. This deficiency resulted in operators not being able to secure HPCI within the fire safe shutdown credited four

minute time limit. The licensee entered this performance deficiency into their corrective action program for resolution.

Analysis: The team referred to MC 0612 and determined this issue was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the objective of ensuring the reliability and availability of the RCIC system and MSRVs under postulated fire safe shutdown conditions.

The team assessed this finding in accordance with NRC Manual Chapter 0609, Appendix F, "Fire Protection Significance Determination Process." This finding affected operator response to postulated fires in the Unit 1 cable spreading room, the Unit 2 cable spreading room, and the combined control room. Based upon the screening criteria of Appendix F and using conservative fire scenario characterizations (medium degradation) and propagation (frequency and confinement), this finding screened to very low risk significance (Green) per Task No. 2.3.5. In support of this risk significance conclusion, the team noted that the Unit 1 and 2 cable spreading rooms are designated transient combustible free zones, fire/smoke detection systems alarm in the control room, automatic sprinkler systems and manual CO<sub>2</sub> suppression systems are installed, and the electrical cables installed are flame retardant in accordance with Institute of Electrical and Electronic Engineers (IEEE) 383, "IEEE Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations." Similar fire scenario assumptions and design attributes were credited with respect to postulated fires in the control room and the team noted that the control room is continuously manned. Accordingly, the risk contribution to this finding associated with postulated control room fires is negligible. This significance determination was independently reviewed and verified by a Region I Senior Reactor Analyst.

Enforcement: License Condition 2.C.3 for LGS Unit 1 and Unit 2 states that, "Exelon Nuclear shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the UFSAR." Appendix 9A of the UFSAR requires the licensee to comply with BTP CMEB 9.5-1, position C.5.c, Alternative or Dedicated Shutdown Capability. The BTP CMEB 9.5-1, position C.5.c.3 requires procedures to implement the capability to perform alternative (remote) shutdown. Contrary to these requirements, from approximately October 14, 2004, to August 3, 2007, the licensee's procedure for remote shutdown was not adequate to prevent overfilling of the reactor vessel following a spurious, fire-induced start of HPCI. Because the finding was of very low safety significance and has been entered into LGS's corrective action program (IR 656185), this violation is being treated as a non-cited violation (NCV), consistent with Section VI.A.1 of the NRC Enforcement Policy. **NCV 05000352, 353/2007006-01, Inadequate Fire Safe Shutdown Procedure for Securing HPCI.**

.02 Protection of Safe Shutdown Capabilities

a. Inspection Scope

The team reviewed the fire hazards analysis, safe shutdown analyses and supporting

drawings and documentation to verify that safe shutdown capabilities were properly protected. The team ensured that separation requirements of the UFSAR, were maintained for the credited safe shutdown equipment including supporting power, control and instrumentation cables. This review included an assessment of the adequacy of the selected systems for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and associated support system functions.

The team reviewed the licensee's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and controlling combustible loading within limits established in the FHA. A sample of hot work and transient combustible control permits were also reviewed. The team performed plant walkdowns to verify that protective features were being properly maintained and administrative controls were being implemented.

The team also reviewed the licensee's design control procedures to ensure that the process included appropriate reviews and controls to assess plant changes for any potential adverse impact on the fire protection program and/or post-fire safe shutdown analysis and procedures.

b. Findings

No findings of significance were identified.

.03 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to observe the material condition and design adequacy of fire area boundaries (including walls, fire doors and dampers), and electrical raceway fire barriers to ensure they were appropriate for the fire hazards within the area.

The team reviewed installation/repair and qualification records for a sample of penetration seals to ensure the fill material was of the appropriate fire rating and that the installation met the engineering design. The team also reviewed similar records for fire protection wraps to ensure the material was of an appropriate fire rating and that the installation met the engineering design.

b. Findings

No findings of significance were identified.

.04 Active Fire Protection

a. Inspection Scope

The team reviewed the design, maintenance, testing, and operation of the fire detection and suppression systems in the selected plant fire areas. This included verification that the manual and automatic detection and suppression systems were installed, tested, and maintained in accordance with the National Fire Protection Association (NFPA) code of record, or as NRC approved deviations, and that each suppression system would control or extinguish fires associated for the hazards in the selected areas. A review of the design capability of suppression agent delivery systems was verified to meet the code requirements for the fire hazards involved. The team also performed a walkdown of accessible portions of the detection and suppression systems in the selected areas as well as a walkdown of major support equipment in other areas (e.g., fire pumps, carbon dioxide (CO<sub>2</sub>) storage tanks and supply system) and assessed the material condition of the systems and components.

The team reviewed electric and diesel fire pump flow and pressure tests to ensure that the pumps were meeting their design requirements. The team also reviewed the fire main loop flow tests to ensure that the flow distribution circuits were able to meet the design requirements.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team reviewed pre-fire plans and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown. In addition, the team inspected the fire brigade's protective ensembles, self-contained breathing apparatus (SCBA), and various fire brigade equipment (including smoke removal equipment) to verify fire fighting readiness.

b. Findings

No findings of significance were identified.

.05 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team reviewed documents and walked down the selected fire areas to verify that redundant trains of systems required for hot shutdown were not subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. Specifically, the team verified that:

- A fire in one of the selected fire areas would not directly, through production of smoke, heat or hot gases, cause activation of suppression systems that could potentially damage all redundant safe shutdown trains.
- A fire in one of the selected fire areas (or the inadvertent actuation or rupture of a fire suppression system) would not directly cause damage to all redundant safe shutdown trains (e.g., sprinkler caused flooding of other than the locally affected train).
- Adequate drainage was provided in areas protected by water suppression systems.

b. Findings

No findings of significance were identified.

.06 Alternative Shutdown Capability

Alternative shutdown capability for the selected fire areas inspection utilizes shutdown from outside the control room and is discussed in Section 1R05.01 of this report.

.07 Circuit Analyses

a. Inspection Scope

The team verified that the licensee performed a post-fire safe shutdown analysis for the selected fire areas and that the analysis appropriately identified the structures, systems, and components important to achieving and maintaining post-fire safe shutdown. Additionally, the team verified that licensee's analysis ensured that necessary electrical circuits were properly protected and that circuits that could adversely impact safe shutdown due to hot shorts, shorts to ground, or other failures were identified, evaluated, and dispositioned to ensure spurious actuations would not prevent safe shutdown.

The team's review considered fire and cable attributes, potential undesirable consequences and common power supply/bus concerns. Specific items included the credibility of the fire threat, cable insulation attributes, cable failure modes, spurious actuations, and actuations that could result in a loss of coolant event.

The team also reviewed cable routing data sheets and wiring diagrams for a sample of components to verify that all necessary cables had been included in the safe shutdown analysis and that the routing ensures safe shutdown equipment cables remained free from fire damage.

Cable failure modes were reviewed for the following components:

- HV49-2F029, HV49-2F031, RCIC Suppression Suction Valves;
- HV49-2F012, HV49-2F013, RCIC Pump Discharge Valves;
- PSV41-2F013A, C, and N, SRVs;
- HV51-2F004A, HV51-2F006A, RHR Loop A Pump Suction Valves;
- 2AP202, RHR Pump A; and
- HV51-2F017A, LPCI Outboard Containment Isolation Valve.

The team reviewed circuit breaker coordination studies to ensure equipment needed to conduct post-fire safe shutdown activities would not be impacted due to a lack of coordination. The team confirmed that the coordination studies addressed multiple faults due to fire. Additionally, the team reviewed a sample of circuit breaker maintenance records to verify that circuit breakers for components required for post-fire safe shutdown were properly maintained in accordance with procedural requirements.

b. Findings

No findings of significance were identified.

.08 Communications

a. Inspection Scope

The team reviewed safe shutdown procedures, the safe shutdown analysis, and associated documents to verify an adequate method of communications would be available to plant operators following a fire. During this review, the team considered the effects of ambient noise levels, clarity of reception, reliability, and coverage patterns. The team also inspected the designated emergency storage lockers to verify the availability of portable radios for the fire brigade and plant operators. The team also verified that communications equipment such as repeaters and transmitters would not be affected by a fire.

b. Findings

No findings of significance were identified.

.09 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of eight-hour emergency lights throughout the selected fire areas and evaluated their adequacy for illuminating access and egress pathways and any equipment requiring local operation and/or instrumentation monitoring for post-fire safe shutdown. The team also verified that the battery power supplies were rated for at least an eight-hour capacity. Preventive

maintenance procedures, the vendor manual, completed surveillance tests, and battery replacement practices were reviewed to verify that the emergency lighting was being maintained in a manner that would ensure reliable operation.

b. Findings

No findings of significance were identified.

.10 Cold Shutdown Repairs

a. Inspection Scope

The team verified that the licensee had dedicated repair procedures, equipment, and materials to accomplish repairs of components required for cold shutdown which might be damaged by the fire to ensure cold shutdown could be achieved within the time frames specific in their design and licensing bases. The inspectors verified that the repair equipment, components, tools, and materials (e.g. pre-cut cables with prepared attachment lugs) were available and accessible on site.

b. Findings

No findings of significance were identified.

.11 Compensatory Measures

a. Inspection Scope

The team verified that compensatory measures were in place for out-of-service, degraded, or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment, passive fire barriers, pumps, valves or electrical devices providing safe shutdown functions or capabilities). The team also verified that the short term compensatory measures compensated for the degraded function or feature until appropriate corrective action could be taken and that licensee was effective in returning the equipment to service in a reasonable period of time.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA2 Identification and Resolution of Problems

.01 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team verified that the licensee was identifying fire protection and post-fire safe shutdown issues at an appropriate threshold and entering them into the corrective action program. The team also reviewed a sample of selected issues to verify that the licensee had completed or planned appropriate corrective actions.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On August 9, 2007, the team presented the inspection results to Mr. C. Mudrick, Site Vice President, and other members of the site staff. No proprietary information was included in this inspection report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Exelon Generation Company

C. Mudrick, Site Vice President  
E. Callan, Plant Manager  
B. Dickinson, Director of Engineering  
P. Gardner, Director of Operations  
C. Rich, Director of Training  
S. Bobyock, Manger Engineering Programs  
J. Brittain, NOS  
C. Bruce, Fire Program Engineer  
F. Burzinski, Fire Marshall  
P. Chaso, Supervisor  
S. Cleaver, Engineering Design Fire  
D. Doran, Sr. Manger Systems Engineering  
M. Evans, Systems Engineer Fire Protection  
D. Hamilton, Sr. Manager Engineering Design  
R. Harding, Regulatory Assurance  
R. George, Manager Electrical Design  
M. Jesse, Manager NOS  
E. Kelly, Engineering Manager  
R. Kreider, Manger Regulatory Assurance  
M. Kurchet, Dresden  
C. Pragman, Corporate Fire Protection  
M. Taylor, Corporate Fire Protection

NRC

J. Rogge, Chief, Engineering Branch 3, Division of Reactor Safety  
W. Cook, Senior Reactor Analyst, Division of Reactor Safety  
S. Hansell, Senior Resident Inspector, LGS  
C. Bickett, Resident Inspector, LGS

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

NONE

Open and Closed

05000352, 353/2007006-01                      NCV    Inadequate Fire Safe Shutdown Procedure  
for Securing HPCI (Section 1R05.01)

Closed

NONE

Discussed

NONE

**LIST OF DOCUMENTS REVIEWED**

Fire Protection Licensing Documents

LGS, SER (NUREG 0991, 8/1983)  
LGS, SSER 2  
LGS, SSER 4  
LGS UFSAR, Section 9.5, Other Auxiliary Systems, Fire Protection Program  
LGS UFSAR, Section 9A, Fire Protection Evaluation Report

Design Basis Documents

L-S-39,                      RCIC Design Basis Document, Rev. 11  
L-S-51,                      Fire Protection System, Rev. 5  
L-T-10,                      LGS, Fire Safe Shutdown, Rev. 10

Calculations/Engineering Evaluation Reports/Specifications

EAS-26-0489,                      LGS, Safe Shutdown Analysis for Fire Events, 5/1989  
G-080-VC-00028,                      Thermal Hydraulic Analysis for Fire Events, Rev. 0  
GE-NE-A13-00410-10,                      LGS, Assessment of Post Fire Safe Shutdown  
Methodology Changes, 12/1997  
LEAF-0086,                      Walkdown Paths for FSSD Man. Actions/Repairs, Rev. 0  
LEAM-0001,                      HPCI and RCIC Lds. During Fire Safe Shutdown, Rev. 0A  
LF-0016-012,                      Fire Area 12 Fire Safe Shutdown Analysis, Rev. 0  
LF-0016-023,                      Fire Area 23 Fire Safe Shutdown Analysis, Rev. 1  
LF-0016-068E,                      Fire Area 68E Fire Safe Shutdown Analysis, Rev. 0  
LF-0016-068W,                      Fire Area 68W Fire Safe Shutdown Analysis, Rev. 1  
LF-0016-079,                      Fire Area 79 Fire Safe Shutdown Analysis, Rev. 1  
NE-0294,                      Specification for Post-Fire Safe Shutdown Program  
Requirements at LGS, Rev. 3

## A-3

NPB-14,	Moderate Energy Line Break Analysis for Reactor Enclosures, Rev. 6
NPB-57,	MFPB Analysis - Fire Protection System Operation, Rev. 1
6900E.11,	Load Circuit-Overcurrent Trip Devices, Rev. 8
6900E.23,	Safeguard 208/120V AC Panel Circuit Breaker Coordination, Rev.1
8031-M-49-117-(1)-2,	Man. Water Spray Hydraulic Calc. Sys. WP-75, Rev.0
8031-M-49-117-(2)-1,	Man. Water Spray Hydraulic Calc. Sys. WP-75, Rev.0
534749-45-02,	Eval. of Ultra-Low Sulfur Diesel (ULSD) Fuel for Diesel Driven Fire Pumps

### Procedures

A-C-134,	Control of Hazard Barriers, Rev.4
A-C-134-5,	Control of Hazard Doors/Hatches/Panels at Limerick Generating Station (LGS), Rev.15
CC-AA-209,	Fire Protection Program Configuration Change, Rev.1
CC-MA-209-1001,	Fire Protection Program Configuration Change Review, Rev.1
ER-AA-610-1001,	Performance Based Evaluations for Fire Protection, Rev.3
ER-AA-610-1002,	Fire Protection Program Performance Indicators, Rev.1
OP-AA-201-001,	Fire Marshal Tours, Rev.2
OP-AA-201-002,	Fire Reports, Rev.2
OP-AA-201-003,	Fire Drill Performance, Rev.8
OP-MA-201-004,	Fire Protection for Hot Work, Rev.1
OP-AA-201-005,	Fire Brigade Qualification, Rev.5
OP-AA-201-006,	Control of Temporary Heat Sources, Rev.3
OP-MA-201-007,	Fire Protection System Impairment Control, Rev.4
OP-AA-201-008,	Pre-Fire Plans, Rev.1
OP-AA-201-009,	Control of Transient Combustible Material, Rev.5
ST-6-022-551-0,	Fire Drill, Rev.7

### Operations Procedures

1FSSG-3012,	Fire Area 12 Fire Guide, Rev. 3
1FSSG-3068W,	Fire Area 68W Fire Guide, Rev. 2
2FSSG-3023,	Fire Area 23 Fire Guide, Rev. 2
2FSSG-3023,	Fire Area 23 Fire Guide, Rev. 3
2FSSG-3079,	Fire Area 79 Fire Guide, Rev. 0
OP-LG-101-111,	Shift Staffing Requirements, Rev. 0
S92.1.O,	Local and Remote Manual Startup of a Diesel Generator, Rev. 46
SA-AA-129,	Electrical Safety, Rev. 4
SE-1,	Remote Shutdown, Rev. 54
SE-1,	Remote Shutdown, Rev. 55
SE-1-1,	Protected Depressurization Control, Rev. 12
SE-1-2,	Protected Power Source, Rev. 7

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SE-1-3, Protected Ventilation Source, Rev. 10  
SE-8, Fire, Rev. 30

Completed Tests/Surveillances

RT-2-085-600-0, Functional Test of Alternate Shutdown Communication System, Rev. 11, Completed 4/24/2007

RT-2-108-300-1, FSSD ELU 8 Hour Capacity Verification Test, Rev.9, Completed 09/26/06

RT-2-108-300-2, FSSD ELU 8 Hour Capacity Verification Test, Rev.9, Completed 10/18/06

RT-6-000-900-0, Inspection of Safe Shutdown Equipment, Completed 1/31/06, 8/7/06, & 2/1/07

RT-6-000-994-0, Verification of Operator Qualifications, Rev.11, Completed 05/30/07

ST-2-022-601-1, Fire Detection - Fire Detection Instrumentation Channel Functional Test and Supervisory Circuit Operability Test, Zones 7,8,9,12,13,14 and 15, Rev.21, Completed 05/19/06, Rev.20, Completed 11/03/06

ST-2-022-602-2, Fire Detection - Smoke Detection Instrumentation Channel Functional Test and Supervisory Circuit Operability Test, Zones 21, 23, Rev.11, Completed 02/08/05, Rev.13, Completed 02/07/06

ST-2-022-610-2, Fire Detection - Smoke Detection Instrumentation Channel Functional Test and Supervisory Circuit Operability Test, Zones 68A, 68B, 68C, Rev.14, Completed 05/12/06, Rev.15, Completed 02/21/07

ST-2-022-620-1, Fire Detection - Fire Detection Instrumentation Channel Functional Test and Supervisory Circuit Operability Test, Zone 79, Rev.18, Completed 11/14/06 & 05/29/07

ST-2-022-642-2, Fire Detection - Heat Detection Instrumentation Channel Functional Test and Supervisory Circuit Operability Test, Zone 68A, Rev.9, Completed 12/15/06 & 07/21/06

ST-2-088-320-1, Remote Shutdown System RCIC Operability Test, Completed 6/2/2005

ST-2-088-320-2, Remote Shutdown System RCIC Operability Test, Completed 8/12/2005

ST-4-022-920-1, Fire Rated Assembly Inspection, Rev.3, Completed 05/26/06, Rev.4, Completed 05/24/07

ST-4-022-950-0, Spray and Sprinkler Visual Inspection, Rev.3, Completed 02/12/07

ST-6-022-250-0, Underground Fire Main Flow Test, Rev.4, Completed 09/29/05 & 09/29/06

ST-6-022-252-0, Diesel Driven Fire Pump Flow Test, Rev.27, Completed 06/04/07, Rev.26, Completed 05/11/07

ST-6-022-253-0, Diesel Driven Fire Pump Characteristic Curve Test, Rev.5, Completed 05/11/07, Rev.6, Completed 05/18/07

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ST-6-022-254-0, Motor Driven Fire Pump Characteristic Curve Test, Rev.3,  
Completed 12/26/05, Rev.5, Completed 06/26/07  
ST-6-022-320-0, Unit 1 and Common FSWS Operability Verification, Rev.0,  
Completed 12/16/06  
ST-6-022-600-0, FSWS Flush, Rev.13, Completed 09/22/06

### Quality Assurance (QA) Audits and Self Assessments

LS-AA-126-1001, LGS, Focused Self-Assessment, Fire Protection Program, Rev. 4

### System Health Reports

LIM 091, U1 - 13KV System, 5/2007  
LIM 091, U2 - 13KV System, 5/2007  
LIM P092B, U1 - 4 KV System, 5/2007  
LIM P092B, U2 - 4 KV System, 5/2007  
LIM 093, U0 - 480 V System, 5/2007  
LIM 093, U1 - 480 V System, 5/2007  
LIM 093, U2 - 480 V System, 5/2007  
LIM 094, U1 - 120 VAC System, 5/2007  
LIM 094, U2 - 120 VAC System, 5/2007  
LIM 095, U1 - DC System, 5/2007  
LIM 095, U2 - DC System, 5/2007

### Engineering Change Requests

LG 96-02491, UFSAR Change to Provide Explanatory Notes for Fire Drills, Rev.0  
LG-97-03146, Installation Package, ESW Pump A, 11/12/97  
LG-97-03148, Mod P000701-1:Installation Package, EDG 1AG501, 11/12/97  
LG 01-00897, Barriers and Defensive Positions - Control Structure, Rev.0

### Drawings & Wiring Diagrams

C-11, Sht. 1, Yard-work Fire System, Rev.44  
C-191, Sht. 1, Reactor Building Units 1 & 2 Structural Steel Column Schedule,  
Rev.24  
C-191, Sht. 2, Reactor Building Units 1 & 2 Structural Steel Fire Proofing  
Column Schedule, Rev.0  
C-756, Control Room Area Interior Walls El.180'-0" to El.332'-0" Area 8,  
Rev.21  
E-1, Sht. 1, Single Line Diagram Station, Rev. 26  
E-15, Single Line Meter & Relay Diagram 4 KV Safeguard Power  
System 1 Unit, Rev. 27  
E-16, Single Line Meter & Relay Diagram 4 KV Safeguard Power  
System 2 Unit, Rev. 22

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E-24,	Single Line Meter & Relay Diagram Load Center Load Tabulation Safeguard Load Center - 1 & 2 Units, Rev. 19
E-26, Shts. 1-2,	Single Line Diagram, 120V AC Power Supply HVAC Safeguard MOVs & Dampers
E-28,	Single Line Meter & Relay Diagram D114, D124, D134, D144, Safeguard Load Centers, 440 V - 1 Unit, Rev. 18
E-29,	Single Line Meter & Relay Diagram D214, D224, D234, D244, Safeguard Load Centers, 440 V - 2 Unit, Rev. 17
E-30, Shts. 1-3,	Single Line Diagram Instrumentation AC System 1 Unit
E-31, Shts. 1-3,	Single Line Diagram Instrumentation AC System 2 Unit
E-33, Shts. 1-3,	Single Line Meter & Relay Diagram 125/250 VDC System 2 Unit
E-34, Shts. 1-3,	Single Line Meter & Relay Diagram 125/250 VDC System 2 Unit
E-80,	Schematic Meter & Relay Diagram D11 & D12 Safeguard Buses, 4KV 1 Unit, Rev. 18
E-81,	Schematic Meter & Relay Diagram D13 & D14 Safeguard Buses, 4KV 1 Unit, Rev. 20
E-82,	Schematic Meter & Relay Diagram D21 & D22 Safeguard Buses, 4KV 2 Unit, Rev. 19
E-83,	Schematic Meter & Relay Diagram D23 & D24 Safeguard Buses, 4KV 2 Unit, Rev. 21
E-84,	Schematic Meter & Relay Diagram Diesel Generators, 4KV 1&2, Rev. 18
E-102,	Schematic Block Diagram RHR System 1 & 2 Units, Rev. 33
E-105,	Schematic Diagram RCIC System 1 & 2 Units, Rev. 28
E-110,	Schematic Block Diagram Auto Depressurization & Standby Liquid Control Systems - 1 & 2 Units
E-321, Sht. 2,	Emergency Service Water Pumps - Common, Rev. 19
E-360,	Schematic Diagram RHR Pumps 1 & 2 Units
E-591, Shts. 1-2,	D11 Diesel Generator Control & Auxiliaries
E-1652, Sht.1,	Communication & Fire Alarm Layout Turbine Enclosure Unit 1 Above El.239'-0" & 254'-0", Rev.18
E-1667, Sht.1,	Communication & Fire Alarm Diesel Generator Enclosure Unit 1 Above El.217'-0", Rev.7
E-1672, Sht.1,	Communication & Fire Alarm Layout Turbine Enclosure Unit 2 Plan Above El.239'-0" & 254'-0", Rev.3
E-1683, Sht.1,	Communication & Fire Alarm Layout Reactor Enclosure - Unit 2 Plan Above El.253'-0", Rev.10
M-1-B21-1060-E-006,	Elementary Dia. Auto Depressurization System, Rev. 19
M-1-B21-1060-E-020,	Elementary Dia. Auto Depressurization System, Rev. 7
M-1-C61-1050-E-016.3,	Elementary Dia. Remote Shutdown System, Rev. 1
M-1-C61-1050-E-021.1,	SRV Scheme, Rev. 17
M-1-E11-1040-E-032,	Elementary Diagram RHR System
M-1-E11-1040-E-048,	Elementary Diagram RHR System, Rev. 12
M-1-E41-1040-E-021,	HPCI System Elementary Diagram, Rev. 12
M-1-E41-1040-E-025,	HPCI System Elementary Diagram, Rev. 11
M-1-E51-1040-E-020,	Elementary Diagram Reactor Core Isolation, Rev. 10

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M-1-E51-1040-E-033, Elementary Diagram Reactor Core Isolation, Rev. 1  
M-22, Shts. 1 - 9, Fire Protection  
M-71-65, Shts. 1-2, D11 Diesel Generator  
M-1045, Heating, Venting & Air Conditioning Control Area Cable Spreading Room, Rev.32  
PSA-761, Control Room Area Room 8 Interior Wall, Rev.13  
PSA-762, Control Room Area 8 Interior Wall Elevations Wall Nos.59 thru 67 & 107, Rev.11  
PSA-180-2, Sht. 1, Reactor Building Unit 2 Exterior Wall Penetrations Col. Line J Above El.217'-0", Rev.9  
PSA-180-2, Sht .5, Reactor Building Unit 2 Exterior Wall Penetrations Col. Line J Above El.217'-0", Rev.3  
286-1, Sht. 9, Pipe or Conduit thru 3 Hour Rated Fire Barrier, Rev.0  
8031-M-10049.20, Typical 3-Hour Fire Barrier Penetrations, Rev.1  
8031-NE-75-1.5, Cables through Sleeves, Rev.1  
8031-M-10049.15, Typical 3 Hr Fire Barrier Penetrations, Rev.1  
13517, DAF-P-475BM Fire Door, Rev. A

### Piping & Instrumentation Diagrams

8031-M-41, Shts. 1 - 6, Nuclear Boiler Unit  
8031-M-49, Shts. 1 - 2, Reactor Core Isolation Cooling  
8031-M-50, Shts. 1 - 4, RCIC Pump Turbine  
8031-M-51, Shts. 1 - 8, Residual Heat Removal  
8031-M-52, Shts. 1 - 4, Core Spray  
8031-M-55, Shts. 1 - 2, High Pressure Coolant Injection  
8031-M-56, Shts. 1 - 4, HPCI Pump/Turbine

### Vendor Manuals

9140052262, Lightguard F100 Vendor Manual, Rev.0  
9140052272, Lightguard F85 Vendor Manual, Rev.0

### Pre-Fire Plans

F-A-434, Unit 1 D13 Emerg 4KV Switchgear Room 434 (El. 239) Fire Area 12, Rev.8, Rev.9  
F-A-450, Unit 2 Cable Spreading Room (El.254') Fire Area 23, Rev.7, Rev.8  
F-D-311A, D11 Diesel Generator Room and Fuel Oil and Lube Oil Tank Room Rms 311A and 312A (El.217) Fire Area 79, Rev.5, Rev.6  
F-R-475, Unit 2 CRD Equipment and Neutron Monitoring Areas Rooms 475, 476, 477, 479 (El.253) Fire Area 68, Rev.11

Fire Drill Reports

R1035635 09/29/06 R1048774 12/14/06  
R1048000 12/22/06 R1049330 12/16/06  
R0132865 07/21/06 R1047776 09/28/06  
R1047494 09/28/06 R0979387 02/09/05  
R0976593 09/23/04 R0971077 09/23/04  
R0960703 04/18/04 R0952167 03/26/04  
R1020651 06/01/06 R1013883 01/26/06  
R1035635 09/29/06 R1044553 09/28/06  
R1048774 12/14/06 R0966687 07/08/04  
R0964102 07/16/04 R0964993 07/22/04  
R0965532 07/29/04 R0962767 08/05/04

Fire Brigade Training

LGS Fire Brigade Training Records 01/25/06, 05/31/06.

Operator Safe Shutdown Training

Lic. Oper. Requal,	Long Range Training Plan, Rev. 10
LLOJPM0207,	JPM: Emergency Power to 0B ESW Pump, Rev. 9
LLOJPM0250,	JPM: Emergency Power to RCIC Inboard Isolation Valve, Rev. 7
LLOJPM0267,	JPM: Alignment of Equip. for Manual Operation of LPCI, Rev. 2
LLOJPM0268,	JPM: Align. of Long Term Pneumatics for MSRV Op., Rev. 1
LLOR0403D,	Licensed Oper. Requal, SE-1 and SE-6 In-Plant Training, Rev. 0
LLOR0702A,	Licensed Operator Requal, Simulator Training Outline, Rev. 0
LLOR-0702I,	Lic. Oper. Requal, Fire Safe Shutdown Guides - SE-1-3, Rev. 0
LSTS-3403,	Simulator Training Scenario, Fire in Cable Spread Room, Rev. 8
SO1-07-046,	Shift Train. Doc., Prompt Action for HPCI Trip at RSP, 8/3/07

Hot Work and Ignition Source Permits

R1051640  
M1605508  
C0220386

Impairment Permits

A1618979  
A1437776  
A1437799  
A1511486  
A1621745  
A1507935

Transient Combustible Evaluations

A1559298-E53, -E54, -E55, -E57, -E58

Miscellaneous Documents

Archival Operations Narrative Logs from 05/11/07 to 07/18/07  
 Bisco Reports, 748-63-A 03/11/82, 748-64 01/15/82, 748-220 04/15/87  
 INDMS - Cable Location Report  
 INDMS - Safe & Alternative Shutdown Logics  
 NRC Sup. Guid. "Nuclear Plant Fire Protection Functional Responsibilities,"  
 08/29/77  
 EPRI TR-106826, Battery Performance Monitoring by Internal Ohmic  
 Measurements, 12/96  
 Pre-Operational Test Procedure 2P-13.2, Rev.0  
 Startup Field Report 233D-007 Cable Spreading Room Unit 2  
 IISCP for PSL-022-026

Issue Rports

A1354849-E5, E8, E10-12

A1605498

A1615942

273644	260417	267117	359446	469105	248630
446569	523298	581869	605434	607695	617637
619104	621537	621631	627970	628363	630245
635086	649568*	650778*	650889*	650922*	650953*
651373*	651670*	651688*	653136*	654520*	654564*
655258*	656185*	656195*	656207*	656255*	656506*
656756*					

\* NRC identified during this inspection

Work Orders

C0213924	R0631000	R0631028	R0659528
R0662281	R0709266	R0965868	

**LIST OF ACRONYMS USED**

AC	Alternating Current
ADAMS	Agency Documents Access and Management System
BTP	Branch Technical Position
CFR	Code of Federal Regulations
CMEB	Chemical Engineering Branch
CO <sub>2</sub>	Carbon Dioxide
DRS	Division of Reactor Safety
FA	Fire Area
FHA	Fire Hazards Analysis
FPP	Fire Protection Program
HPCI	High Pressure Coolant Injection
IEEE	Institute of Electrical & Electronic Engineers
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
IR	Information Request
LGS	Limerick Generating Station
LPCI	Low Pressure Coolant Injection
MSRV	Main Steam Relief Valve
NCV	Non-cited Violation
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
P&ID	Piping and Instrumentation Drawing
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
SCBA	Self Contained Breathing Apparatus
SDP	Significance Determination Process
SER	Safety Evaluation Report
SUNSI	Sensitive Unclassified Non-Safeguards Information
UFSAR	Updated Final Safety Analysis Report